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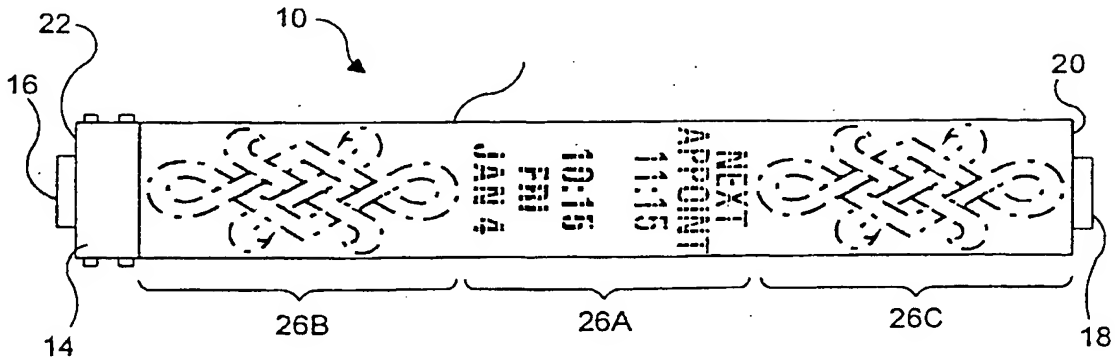
(54) Title: A BRACELET FOR DISPLAYING TIME AND/OR MOVING IMAGES



(57) Abstract

A bracelet (10) is disclosed with a substantially annular body having an active display (26) at least partially around said body. The display (26) can be formed by a display layer made of a light emitting polymer or on a plurality of interconnected rigid links (102) formed with LCD elements (107). A control circuit associated with the bracelet (10) generates signals defining images shown on the display (26). These images may be static or may be moving images of cartoon characters or real live images. Additionally the control circuit may also generate time images similar to a standard watch to indicate time and other information.

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A BRACELET FOR DISPLAYING TIME AND/OR MOVING IMAGES

BACKGROUND OF THE INVENTION

A. Field of Invention

This invention pertains to a piece of jewelry such as a bracelet which is capable of displaying time and/or other information or, alternatively, to show an esthetic design. Preferably the bracelet is continuous and flexible, or is made of a plurality of rigid or flexible links.

B. Description of the Prior Art

A wristwatch is one of the most common articles worn by people because everyone needs to know the time. A wristwatch typically consists of a watch mounted on a band and the band and/or the watch has a decorative design so that it is esthetically pleasing. However, because the watch itself must remain an integral mechanism, there isn't that much that can be done to improve the appearance of a wristwatch besides changing the colors and materials of the band, the watch casing or its dial.

A further disadvantage of existing wristwatches is that the amount of information that they can be displayed by them is extremely limited. In analog watches, the displays normally consist of two or three hands and a small window for a date and/or day of the week. Digital watches have the capability of providing more data to the wearer however the amount of data that can be displayed at any one time is still extremely limited due to the small size of the watch display area.

OBJECTIVES AND SUMMARY OF THE INVENTION

It is an objective of the present invention to provide a bracelet which has an integral electronically driven display showing the current time and various other data and images.

A further objective is to provide a bracelet which uses an electronic display to provide both a functional purpose, such as indicating current time, and a decorative purpose by showing various artistic motifs.

Yet another objective is to provide a bracelet which has a display capable of showing virtually any type of image, including animations as well as live images.

A further objective is to provide a bracelet capable of showing moving images.

Yet another objective is to provide a bracelet which can be used as a personal information manager.

Other objectives and advantages of the invention shall become apparent from the following description. Briefly, a bracelet constructed in accordance with this invention includes an annular body having an electronic display. Preferably the display extends along around the whole circumferential outer surface of the bracelet, although it may extend only partially around the bracelet as well. The bracelet may consist for example of a flexible band formed of a base, a display layer of a light emitting polymer mounted on said base and a protective transparent cover disposed on the light emitting polymer. The light emitting polymer forms the electronic display. The ends of the band may be coupled by a rigid or flexible link.

A display control circuit preferably housed in the rigid or flexible link and it includes a microprocessor used to selectively form images on the display by generating appropriate signals for the display. These images may include functional elements such as alphanumeric characters indicating the current time, date, day of week and other information. The images may also form decorative elements. The decorative and functional images may be displayed alternatively or simultaneously. A plurality of zones may be defined circumferentially around the bracelet with various functional and/or decorative elements being shown in the zones. The images may be displayed within particular zones or may be moving from one zone to another across the bracelet.

In an alternate embodiment, the band may be replaced by a plurality of rigid or flexible links, each, or at least some of which links being formed with an LCD element. The links are interconnected by mechanical coupling members as well as electrical or optical connectors for transmitting control signals to the display elements.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a bracelet constructed in accordance with this invention being worn by a customer;

Fig. 2 shows an enlarged view of bracelet with various data being displayed to the customer;

Fig. 3 shows a top view of the bracelet in the open configuration;

Fig. 4 shows a partial elevational cross section of the bracelet of Fig. 3;

Fig. 5 shows a block diagram of the electronic circuit used to control the bracelet display of Figs. 1-4;

Fig. 6 shows the display of the subject bracelet partitioned into several regions corresponding to different time zones;

Fig. 7 shows an enlarged view of the display of Fig. 6 showing details of two adjacent regions;

Fig. 8 shows a plan view of the display with moving cartoon images;

Fig. 9 shows a plan view of an alternate embodiment of the invention; and

Fig. 10 shows a cross sectional view of a link making up the embodiment of Fig. 10.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to Figs. 1-4, a bracelet 10 constructed in accordance with this invention consists of a relatively flexible band 12 and a link 14 coupled to the band 12. The link 12 has on the side opposite its connection to the band 12 a coupling member 16. Similarly band 12 has on its longitudinal free end 20 opposite the link 14 a coupling member 18. Coupling members 16 and 18 cooperate to selectively couple the free end 20 of band 12 thereby forming an annular body for the bracelet 10. Alternatively, other coupling means may also be provided which allow the ends 20 and 22 to separate from each other to allow the bracelet 10 to be selectively mounted and dismounted from the customer's wrist in the usual manner. Couplings of this type are well known in the art and will not be described any further.

As best seen in Fig. 4, band 12 may be formed of three laminated layers: a base 24, an optically active layer 26 and a transparent protective layer 28. Base 24 provides strength and dimensional stability to the bracelet 10, and is preferably made of a material

non-porous material such as Teflon ®. Since layers 26 and 28 are substantially transparent, layer 14 may include a solar panel which may be used to provide power to the display layer 26 and/or its control circuitry. The bottom surface of the base contacting the wearer's skin may be attached to a layer of another material, such as leather to make the band more comfortable to wear. Attached to the base 24 is the layer 26 which preferably is made of light emitting polymer (LEP) and defines a plurality of active display elements or pixels which can be selectively activated, i.e., turned on or off, by applying an electrical signal thereto. Light emitting polymers have been described by Cambridge Display Technology of Cambridge, UK. The number of pixels formed on layer 26 is determined primarily by the dimensions of the band 12. It is expected that band 12 may have an array of 256 x 1024 pixels or more. Alternatively, instead of pixels arranged in a two dimensional array, individual image elements may be formed by layer 26. For example, in Fig. 8 several images are shown which may be generated either by array of pixels or by separate image elements (i.e., an image element shaped as a palm tree, another element shaped as a dinosaur and so on.

Finally, layer 28 is of a thin flexible transparent material made of nylon or similar material arranged to protect the display layer 26 from water, dirt, and other materials.

Link 14 performs a dual function. It provides the means for connecting the longitudinal ends of the band 12 as discussed above. Moreover, it also acts as a housing for one or more electronic circuits as discussed in more detail below, as well as a battery for power these circuits, and the active display. (In the Figures, the link 14 is shown as being circumferentially separate from the band 12 for the sake of clarity, however, the display layer can in fact be constructed to extend over and cover the link 14 thereby effectively rendering the whole surface of the bracelet a screen. Moreover, the link 14 may itself be rigid or flexible).

The electronic elements forming the control circuit for the bracelet 10 are shown in Fig. 5. These elements include a battery 30 which provides power for the whole system, a memory 32, a microprocessor 34, selector buttons 36 and a display driver 38 used to drive the pixels or other display elements of display layer 26. The microprocessor 34 retrieves data from memory 32 regarding the images to be shown on the display layer 26. The number, size, color, and content of these images is dependent

on the programming of the microprocessor. The microprocessor also receives commands from the wearer via selector buttons 36.

The big advantage of the subject bracelet is obvious from the above description. The old fashioned mechanical wrist watches as well as the newer electronic watches with analog movements consisted of dial with two or more hands. The amount of information that these devices could provide was very limited. Electronic watches with digital displays were more flexible since many did have the capability of displaying more information then just time. However as a practical matter, since their display as compared to the total surface area of the wrist watch was limited to at most twenty or so characters, from a practical point of view, the digital watches could not provide much information efficiently. As opposed to these prior art wristwatches, the present bracelet is provided with a display preferably covering its whole outer surface and hence a large variety of useful information as well as decorative and entertaining images can be shown thereon.

Following are some examples in which the bracelet 10 can be used. Figures 2 and 4 show how the microprocessor 34 could be programmed to show time images which approximate the arrangement and functionality of a standard watch. In this mode, the display layer 26 is partitioned into essentially a central zone 26A and two end zones 26B and 26C. The central zone 26A is positioned to be on top of the bracelet 10 as it is worn on the wrist so that it is most visible. In this zone 26A, the microprocessor 34 is programmed to generate a time image formed of alphanumeric characters indicating a current time, day of the week, and date, as seen clearly in Fig. 2. Since more pixels are available in zone 26A then necessary for these basic functions, additional data may also be provided. For example, the bracelet may be used as a personal information manager (PIM) to indicate to the user other data, such as his next appointment as indicated in Fig. 2 at X. Alternatively, and while still using the bracelet 10 as a watch and a PIM, the user may look up a telephone number, address, or other information. This information is stored in memory 32 and accessed by the user through selector buttons 36 or other means. For example, a touch screen (not shown) may be provided on top of the layer 24. In this instance, the band 12 may have to be reinforced to insure that the touch screen is supported sufficiently to avoid false operations.

Zones 26B and 26C are not used in this mode to provide information. Instead, the microprocessor 34 generates still or moving decorative images in these zones. For formal occasions, or if the user elects not to have complex images, then these zones 26B and 26C may be 'painted' by the microprocessor to a neutral color, matching for example the background of zone 26A or the clothing of the wearer.

Fig. 6 shows the display 26 partitioned into a plurality of watch zones 26E-26K, each zone being used to provide different data. For example, for a business man conducting transactions all over the world, each of these zones may correspond to a different geographic locality of interest. Fig. 7 illustrates, for example, watch zones 26H and I with the local current time for New York and Los Angeles respectively. The wearer can select from a menu presented by the microprocessor 34 the number of geographic localities by using the selector buttons 36 or the touch screen. The microprocessor then generates the current time for each of these geographic localities.

In the embodiments described so far, specific functions, such as, for example, the watch function for indicating time, are associated with a specific area or zone of the display. However, in the present invention, various functions may be selectively designated for any zone or area of the display, or they may move from zone to another in accordance with some designated parameters. For example, the user may decide to have the time image on a portion of the band 12 which is always facing him, independently of the orientation of his wrist, so that he does not have to rotate his wrist to see the time. For this purpose, the control circuit includes an orientation sensor 40 which senses the orientation of the band and sends an indication to the microprocessor 34 indicative of this orientation. The microprocessor 34 then generates the time image in an area of band 12 dependent on this orientation selected such that this watch function is visible to the user. If the user shifts or twists his wrist, the new orientation of the bracelet 10 is sensed by sensor 40, and the watch function is repositioned accordingly.

In another embodiment of the invention, moving picture data is either originally stored in memory 32 or is downloaded through an interface 42. Using this data, the microprocessor 37 can either continuously or at regular intervals generate a moving image on display layer 26. For example, as shown in Fig. 8, the moving image may consist of several cartoon characters moving across the band 12 in one direction or another. This embodiment is particularly attractive to children and teenagers. Standard

images such as a time image could be superimposed on these moving images at any particular zone, as described above. Alternatively, the time image may be turned on and off at predetermined intervals and/or in response to commands from the user through control buttons 36.

In an alternate embodiment, instead of an LEP layer, LCD elements are used. Preferably, each LCD element is an active matrix LCD (AM-LCD) formed on a semiconductor substrate. Devices of this kind are presently available from the MicroDisplay Corporation of Richmond, California and Kopin Corporation of Taunton, Massachusetts. As shown in Figs. 9 and 10, since these displays are not very flexible, in this embodiment, instead of a single continuous band, bracelet 100 is formed of a plurality of interconnected links 102. Each link is formed of a base 104 of a stiff material, which may or not be metallic. Base 104 supports substrate 106 which is formed with a top surface defining an LCD display element 107. Covering the LCD display is a protective transparent layer 108. Each link 102 is connected electrically to the adjacent links by cable 110 and mechanically by coupling elements 112. Bracelet 100 is also provided with a control link 114 which is similar to link 14 in Fig. 3 and houses a control circuit for controlling the images shown by the displays 107. The control signals from link 14 to links 102 are transmitted by cable 110. In this manner, the links 102 cooperate to form a display area around the bracelet 100 allowing the bracelet 100 to function in substantially the same manner as the bracelet 10.

Cable 110 maybe replaced by optical couples disposed between adjacent edges of links.

Obviously numerous modifications may be made to this invention without departing from its scope as defined in the appended claims.

We claim:

1. A bracelet comprising:

an annular body with an outer surface extending substantially around said body, said outer surface including a display area defined by an active display element for selectively displaying images; and

a display control circuit disposed within said body and generating signals for said display element, said signals defining said images.

2. The bracelet of claim 1 wherein said body includes a continuous band having two ends and a link selectively coupling said two ends together.

3. The bracelet of claim 2 wherein said display control circuit is disposed in said link.

4. The bracelet of claim 1 wherein said display element is made from a light emitting polymer.

5. The bracelet of claim 1 wherein said body is formed of a plurality of display links coupled together, each of said links having an outer surface bearing a respective display segment.

6. The bracelet of claim 5 wherein said display segment is an LCD.

7. A bracelet comprising:

a flexible annular body with a display extending at least partially circumferentially around said body; and

a control circuit associated with said body and adapted to generate control signals defining images on said display.

8. The bracelet of claim 7 wherein said control circuit is arranged to generate moving images that move across said display.

9. The bracelet of claim 8 wherein said control circuit is arranged to generate images which move circumferentially around said body.

10. The bracelet of claim 7 wherein said display is partitioned into zones, each zone being designated for a particular function including at least one watch zone, said control circuit generating a time image in said watch zone, said time image indicating the current time.

11. The bracelet of claim 10 wherein said control circuit generates time images for each said zone, each time image corresponding to a different geographic locality.

12. The bracelet of claim 7 further comprising an orientation sensor locator for generating an orientation signal indicative of the orientation of said bracelet and said control circuit receiving said orientation signal and generating a watch zone on said display, the location of said watch zone being dependent on said orientation signal.

13. The bracelet of claim 7 wherein said display element is made of a light emitting polymer.

14. The bracelet of claim 7 wherein said display element comprises an LCD.

15. A wristwatch comprising:

a flexible band forming an annular body with an outer surface; said band including a base and a display layer attached to said base and extending at least partially across said outer surface; and

a control circuit connected to said display layer and arranged to generate a time image on said display layer, said time image bearing indicia related to a current time.

16. The wristwatch of claim 15 wherein said display layer is coextensive with a substantial portion of said outer surface and is partitioned into a plurality of zones, said time image being shown in one of said zones.

17. The wristwatch of claim 16 wherein said control circuit generates signals defining decorative images, said decorative images being shown in the remaining zones.

18. The wristwatch of claim 16 wherein said controller is adapted to selectively move said time image between said zones.

19. The wristwatch of claim 16 when said control circuit selectively activates and deactivates said time image.

20. The wristwatch of claim 15 wherein said display layer is arranged to define a display element having a predetermined shape.

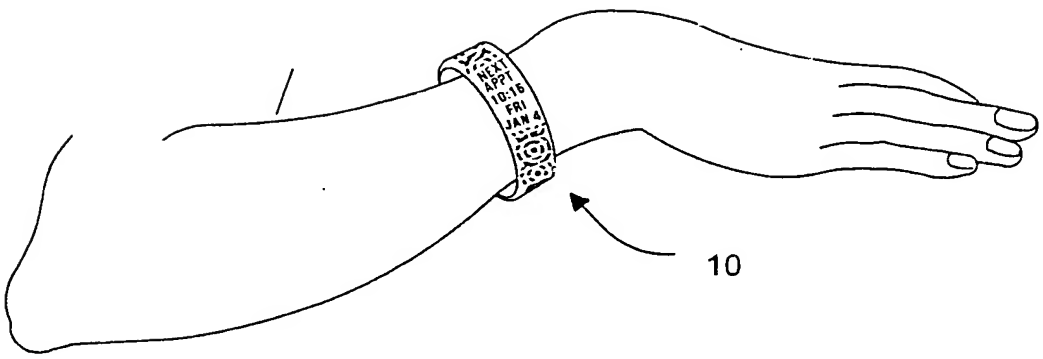

FIG. 1

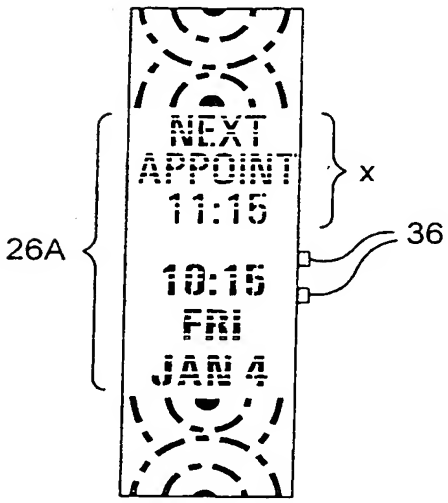

FIG. 2

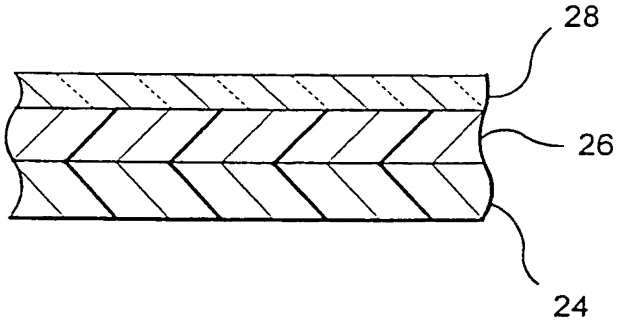

FIG. 4

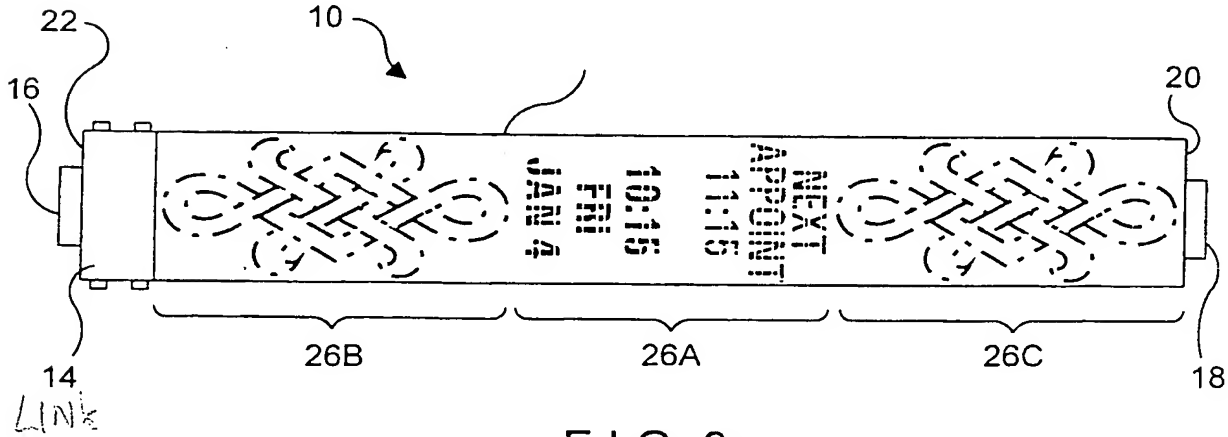

FIG. 3

16, 18
coupling members

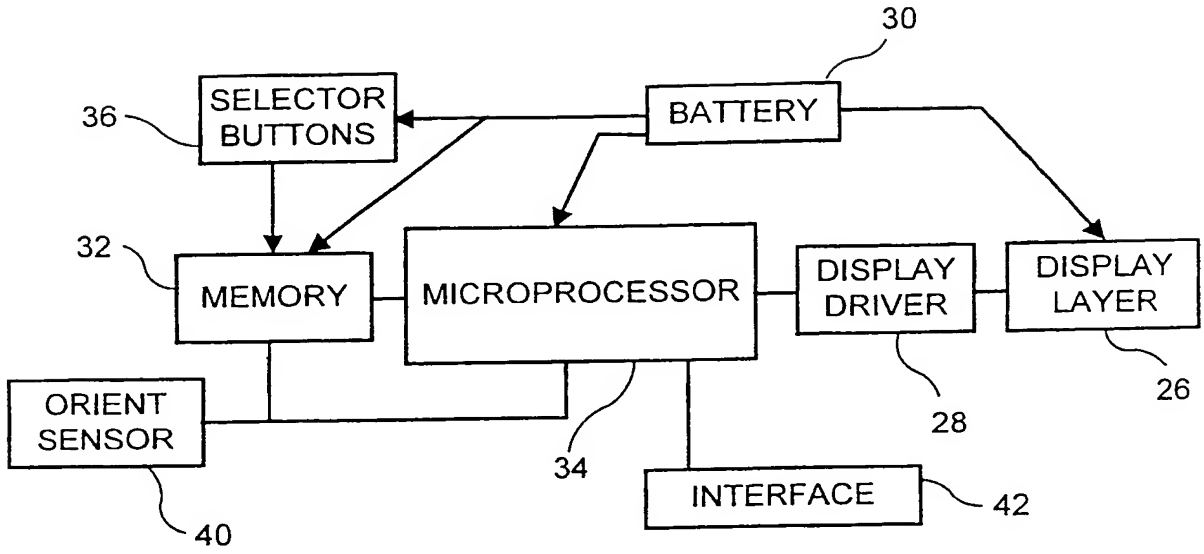

FIG. 5

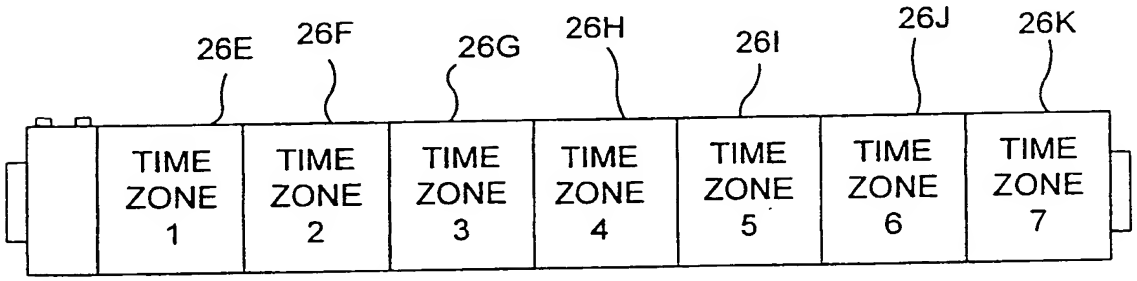

FIG. 6

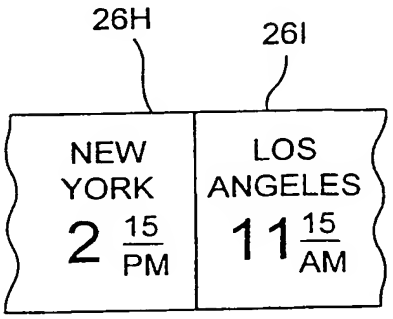

FIG. 7

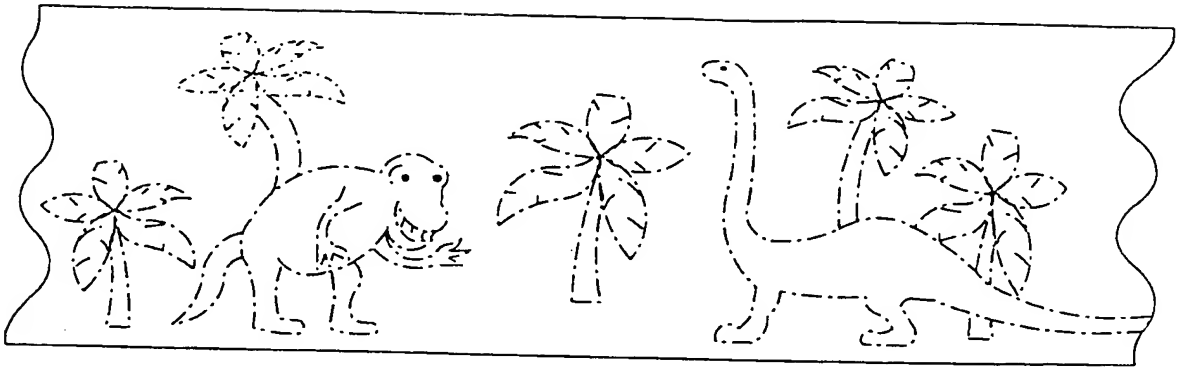

FIG. 8

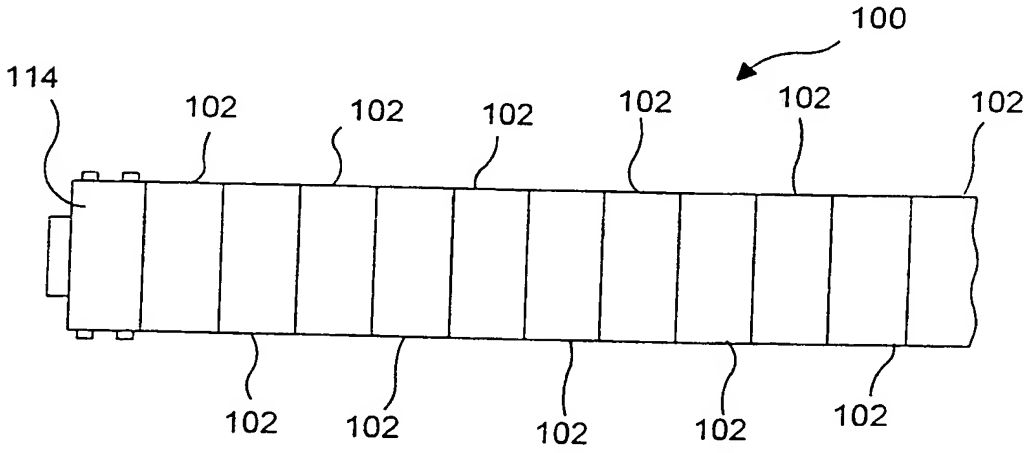

FIG. 9

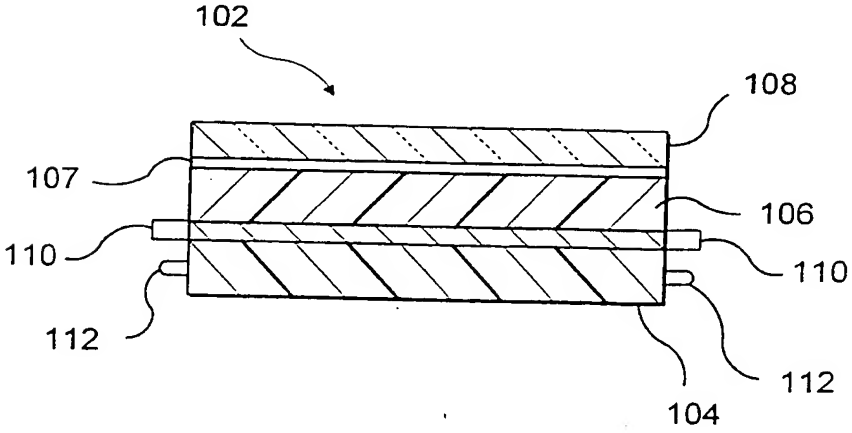

FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :A44C 5/00; G04B 19/00

US CL :63/1.13, 14, 40; 368/223, 225, 242

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 63/1.13, 13, 14, 40; 368/223, 225, 242; 345/4, 55, 113

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NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,130,987 A (SCHICKEDANZ) 26 December 1978 (26.12.1978), col. 3, lines 16-48.	1-3, 5-7, 10, 15-16
A	US 5,821,688 A (SHANKS et al) 13 October 1998 (13.10.1998), see eentire document.	1, 4, 7, 13-14, 18-20
X,P	US 5,931,764 A (FREEMAN et al) 03 August 1999 (03.08.1999), col. 2, lines 21-67, col. 1-58.	1-5, 7-9
Y	US 5,489,922 A (ZLOOF) 06 February 1996 (06.02.1996), col. 4, lines 4-37.	7, 12
Y	US 4,407,295 A (STEUER et al) 04 October 1983 (04.10.1983), col. 4, lines 58-68.	7, 12
Y	WO 96/21888 (RADLEY-SMITH) 18 July 1996 (18.07.1996), abstract.	1-6, 7-11, 15-17

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

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Date of the actual completion of the international search

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Form PCT/ISA/210 (second sheet) (July 1998)*

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PCT/US00/08271

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	DE 3810527 A1 (LUKESCH) 19 October 1989 (19.10.1989), abstract.	1-6, 7-11, 15-17
Y	DE 3813409 A1 (OSTERHAGE) 02 November 1989 (02.11.1989), abstract.	1-6, 7-11, 15-17